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## **Firm Entry Deregulation, Competition and Returns to Education and Skill**

**Ana P. Fernandes**

**Priscila Ferreira**

**L. Alan Winters**

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**Universidade do Minho**



# Firm Entry Deregulation, Competition and Returns to Education and Skill\*

Ana P. Fernandes<sup>†</sup>  
University of Exeter

Priscila Ferreira<sup>‡</sup>  
University of Minho, NIMA

L. Alan Winters<sup>§</sup>  
University of Sussex, CEPR, CEP and IZA

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## Abstract

This paper studies the effect of firm entry deregulation on the returns to skill and education. We use matched employer-employee data for the universe of workers and firms in Portugal and exploit a comprehensive episode of entry deregulation, unique in the industrialized world, as a quasi-natural experiment to investigate how increased competition affects wages. We find that after the reform the returns to a university degree increased by around 5 percent and the returns to skills increased by around 3 percent. We include match (worker-firm) fixed effects and thus identify the effect from individuals who stay in the same firm after the reform. Results are therefore not driven by changes in employment composition, and are supportive of education and skill becoming more valuable after the reform.

**Key Words:** Entry, Deregulation, Product Market Competition, Wage Structure, Returns to Education

**JEL Classification Numbers:** J3.

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<sup>†</sup>Corresponding author. Tel.: +44 1392 723205. Email: a.p.o.fernandes@exeter.ac.uk

<sup>‡</sup>Email: priscila@eeg.uminho.pt

<sup>§</sup>Email: l.a.winters@sussex.ac.uk

# 1 Introduction

All countries regulate firm entry but the extent and nature of the regulations vary widely across the world.<sup>1</sup> Overly-restrictive regulations are likely to be inefficient and have knock-on effects on competition, innovation, employment, wages and economic growth. Deregulation, and in particular the removal of restrictions on firm entry, has been a significant policy recommendation during the last few decades. Aghion et al. (2009) exploit a number of policy reforms in the UK during the Thatcher era to study how entry affects innovation and productivity growth by incumbent firms. Aghion et al. (2008) study the effects of dismantling the License Raj in India on registered manufacturing output, entry, employment and investment. The effects are found to differ across states with different labor market regulations. Bertrand and Kramarz (2002) show that entry regulation in the retail trade industry in France had a negative effect on job creation and employment growth.

This paper exploits an episode of comprehensive entry deregulation as a quasi-natural experiment, and uses linked employer-employee data of the universe of the private sector's firms and workers in Portugal to investigate the effects of deregulation on entry, competition and the returns to education and skill. In July 2005, the new government established the "On the Spot Firm" program.<sup>2</sup> This initiative was created to reduce the time, cost and complexity of starting a business. Prior to 2005 to start a business an entrepreneur would need to visit several public offices and it took 11 procedures, 20 forms and 78 days, making it slower than in any other EU country, and the fees were around 13.5% of GDP per capita.<sup>3</sup> The "On the Spot Firm" program created one-stop shops where entrepreneurs can register a company in a single visit in less than an hour and at a cost of around 3% of GDP per capita. As a result of this reform, Portugal went up in the World Bank "Doing Business" index from 113th to 26th.

A large body of literature has shown that entry and competition spur productivity growth and innovation (e.g. Aghion et al., 2009; Djankov, 2006; Griffith and Harrison, 2004; Griffith, 2001; and Blundell, Griffith, and Van Reenen, 1999), which suggests that the issue is of some importance as European governments search for institutional policies to boost economic growth. This paper contributes to this search by identifying the effects of a single precisely defined policy reform. We use the deregulation reform in Portugal as an exogenous source of increased product market competition and provide quasi-natural experimental evidence of the effects on wages. We exploit the cross-time and cross-municipality variation in the implementation of the business registration reform for identification to measure its effects on the returns to education and skill,

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<sup>1</sup>Djankov et al. (2002) report that while in Italy an entrepreneur needs to follow 16 different procedures, pay US\$3946 in fees, and wait at least 62 business days to acquire the permits to start a business, an entrepreneur in Canada can finish the process in two days by paying US\$280 in fees and completing only two procedures.

<sup>2</sup>Decreto-Lei 111/2005

<sup>3</sup>World Bank (2006).

resulting from the increase in competition.<sup>4</sup> The unusually rich and detailed information from the employer-employee dataset *Quadros de Pessoal* allows us to obtain estimates that account for individual- or match (firm-worker)-specific unobserved heterogeneity, as well as changes in industry composition and regional effects.

The theoretical mechanism that underlies the link between product market competition and returns to skill or education is based on principal-agent theory. Schmidt (1997) and Raith (2003) investigate the effect of competition on the distribution of profits across firms, and how executive compensation responds to changes in competition. In these models, compensation is the result of a two-stage game in a principal-agent setting. Vives (2004), develops a more general model to analyze the effect of competition on relative profits and on product and process innovation.

These models consider the agency problem between owners and managers, but their implications can be applied more broadly to other workers in the firm. In particular, if as product markets become more competitive, profits become more sensitive to costs, firms can reduce production costs either by incentivizing managers or by hiring more skilled workers. In this scenario the motives for managerial incentives also hold for rewarding skills or education. As discussed in Guadalupe (2007), to the extent that skilled workers are more productive than unskilled workers, increased product market competition may induce firms to compete with each other to hire high-skilled workers, which translates into higher returns to skill.

Our results show that the business registration reform had a positive and statistically significant effect on the number of new firms created. These results are consistent with what has been reported in other studies of the effect of deregulation on firm entry (see for example Bruhn (2011) who uses a similar firm entry deregulation in Mexico). In particular, we find that, on average, municipalities with one-stop shops observed around 4.3 additional new firms being created within each industry per year. We also find that the deregulation had a negative and statistically significant effect on industry concentration ratios and on the Herfindahl-Hirschman index (HHI), suggesting that it increased competition within industries.

Commonly used measures of competition, such as concentration ratios or the Herfindahl-Hirschman index face a number of clear limitations discussed in the literature, including potential endogeneity, correlation with omitted variables, non-monotonicity. The main contribution of our paper is therefore to exploit the "on-the-spot firm" business registration reform as an exogenous source of increased competition to present quasi-natural experimental evidence of the effects of competition on the returns to skill and education. Our results suggest that after the reform the returns to having a university degree increased by around 5%, while the wage premium to being high-skilled increased by around 3%. We control for individual fixed effects

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<sup>4</sup>The program expanded over time to municipalities across the country and by the end of 2009 there were 164 one-stop shops dispersed throughout Portugal (see Figure 1) in the next section.

thus eliminating potential biases arising from unobserved individual characteristics. We also control for industry, municipality and year effects to parse out any industry or region characteristics or business shocks that might affect our outcomes. In some of our specifications we control for firm-worker (match) fixed effects, and the wage premium to education and skill remains similar in magnitude and statistical significance. In those specifications, the effect of the reform on returns to education and skill is identified from individuals who stay in the same firm or in the same industry after the deregulation. This suggests that the wage effect reflects not merely higher wages in new jobs but is commensurate with education and skills becoming more valuable after the reform.

Our paper is related to the literature that has studied the effects of large U.S. deregulations on wages. This literature has focused mainly on deregulation in a single industry. In particular, Hirsch and Macpherson (2000) and Card (1986, 1996) study the effect of deregulation in the airline industry in the U.S. on relative earnings of air transport workers. Hirsch (1993) and Rose (1987) analyze wage responses to deregulation in the trucking industry. Black and Strahan (2001) and Wozniak (2007) study the effect of deregulation in the U.S. commercial banking industry on the wages of workers. Our paper adds to this literature by investigating the effects of an economy-wide episode of entry deregulation, which reduced red tape and increased firm entry across industries, on the returns to education and skills, a different aspect of the wage structure.<sup>5</sup>

Another strand of the literature has studied the effects of international trade on wages. Closely related to our paper, Guadalupe (2007) studies the effect of increased competition, resulting from the European Single Market Program and the 1996 appreciation of the British pound, on the returns to skill. Verhoogen (2009) proposed a new mechanism linking trade and wage inequality: quality upgrading due to increased exports. Using the late-1994 peso crisis as a source of variation he shows that quality upgrading induced by the exchange rate shock increased within-industry wage inequality.

The paper is organized as follows. The next section reviews the related literature and the theoretical background. In section 3 we describe the "on the spot firm" business registration reform in Portugal. Section 4 describes the data used and presents descriptive statistics. Section 5 performs correlation analysis between industry concentration ratios and HHI (common measures of competition) and returns to education and skill. Section 6 studies the effect of the "on the spot firm" program on the creation of new firms, and on industry concentration ratios and HHI. Section 7 presents the quasi-natural experiment and discusses the results of the effect of the deregulation on returns to education and skill. The last section concludes.

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<sup>5</sup>Wozniak (2007) and Guadalupe (2007) are two notable exceptions that have studied wage inequality. Wozniak (2007) studies the effect of deregulation in the banking industry on wage inequality for banking employees. Guadalupe (2007) studies the effect of foreign competition on returns to skill.

## 2 Theoretical Background and Related Literature

To the extent that the business registration reform analyzed in this paper reduced entry barriers, it increased competition in the product market. We analyze this hypothesis in section 6 below, before we investigate the effects of the increased competition on the returns to education. The theoretical link between product market competition and compensation is analyzed by Schmidt (1997) and Raith (2003) in a principal-agent setting. They investigate the effect of product market competition on the distribution of profits across firms, and how this affects the compensation scheme. In Schmidt (1997) the competitive environment in which the firm operates affects the contracting between the manager (agent) and the shareholder (principal). Although in this model the employee is modeled as the manager, its predictions could also be applied to any other workers in the firm. An increase in product market competition reduces profits and has two effects on the incentives to exert effort. On one hand it induces the manager to work harder for a cost reduction to avoid liquidation and keep her job, and the owner to provide steeper incentives to the manager. On the other hand, if competition reduces the value of a cost-reduction to the owner, he may want to provide flatter incentives. Overall the effect of competition on incentives is ambiguous.

Raith (2003) allows for entry and exit of firms. As a result of increased competition, prices and profits decrease leading some unprofitable firms to exit. This restores the original profit level and eliminates the opposing effects of a fall in profits present in Schmidt (1997). The model predicts unambiguously that an increase in competition leads firms to provide stronger incentives to their managers to reduce costs. Vives (2004) provides a more general model to analyze the effect of competition on product and process innovation. The net effect of an increase in competition on cost-reducing investments depends on both the residual demand and the elasticity of residual demand faced by the firm. The net effect is ambiguous for most measures of competitive pressure. For example, an increase in the number of competitors will decrease the residual demand for the firm and increase the demand elasticity. The first effect tends to decrease R&D effort while the second tends to increase it, as a unit decrease in costs will decrease price with a higher effect on output.

The effect of changes in competition on the various aspects of compensation to managers and other skilled workers is also an empirical question, which has received some attention in the literature. This previous literature, however, has focused mainly on deregulation in a single industry. In particular, Hirsch and Macpherson (2000) and Card (1986, 1996) study the effect of deregulation in the airline industry in the U.S. on relative earnings of air transport workers. Hirsch (1993) and Rose (1987) analyze wage responses to deregulation in the trucking industry. The authors find that union premia over nonunion wages declined sharply after the deregulation. Black and Strahan (2001), Wozniak (2007) and Cuñat and Guadalupe (2008) study the effect of

deregulation in the U.S. commercial banking industry on the wages of workers and executives' compensation in the banking sector. Our paper adds to this literature by investigating the effects of an economy-wide episode of entry deregulation, which reduced red tape and increased firm entry across industries, on the returns to education and skills, a different aspect of the wage structure.

Another strand of the literature has studied the effects of international trade on wages. Closely related to our paper, Cuñat and Guadalupe (2005) and Guadalupe (2007) study the effect of increased competition, resulting from the European Single Market Program and the 1996 appreciation of the British pound, on wages and the returns to skill. The former find an increase in the performance pay sensitivity of compensation, particularly for executives, and the latter that the returns to skill increased with the increase in competition. Verhoogen (2009) proposed a new mechanism linking trade and wage inequality: quality upgrading due to increased exports. Using the late-1994 peso crisis as a source of variation he shows that quality upgrading induced by the exchange rate shock increased within-industry wage inequality. Finally, our paper is related to the general and vast literature on wage inequality.<sup>6</sup>

### **3 Entry Deregulation in Portugal: The "On the Spot Firm" Program**

In 2005, the Portuguese Ministry of Justice implemented a program aimed at reducing red tape and alleviating the bureaucratic burden associated with setting up a new firm. To start a business in Portugal prior to 2005 an entrepreneur would need to visit several public offices and it took 11 procedures, 20 forms and 78 days, making it slower than in any other EU country. The total expenses were around 13.5 % of GDP per capita.<sup>7</sup> As a result, Portugal ranked 113 out of 155 countries in the Doing Business index of the World Bank. In March 2005 a new Prime Minister took office and in May the government created the Unit for Coordination of Administrative Modernization (UCMA) to bring together the Ministries of Justice, Finance, Economy and Labour and Social Security, which were all involved in starting a business. The main job of the UCMA was to coordinate and aggregate measures by the different ministries.

The "On the Spot Firm" (Empresa na Hora) program was created to reduce the time, cost and complexity of starting a business.<sup>8</sup> This initiative established one-stop shops where entrepreneurs can register a company in less than an hour. It brings all the agencies into a single office so entrepreneurs do not need to visit several public offices to get the required documents

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<sup>6</sup>See the seminal contributions by Juhn, Murphy, and Pierce (1993), Berman, Bound, and Griliches (1994), and Autor, Katz, and Krueger (1998). See also Wood (1994) for evidence on international trade and globalization; and Caroli and Van Reenen (2001), and Garicano and Rossi-Hansberg (2006) for the consequences of organizational change. Machin (1997) and Card (2001) study the effect of labour market institutions.

<sup>7</sup>This compares with an average of 6.8% in the OECD (World Bank, 2006).

<sup>8</sup>[http://www.empresanahora.pt/ENH/sections/EN\\_homepage](http://www.empresanahora.pt/ENH/sections/EN_homepage)

and procedures. In the one-stop shops, the legal and commercial registration is completed and the company identification card, the corporate tax payer number and the social security number are all handed over in the same day. All the details are then sent to the tax authorities to ensure the security of the incorporation procedures for new companies.

The law that creates the "On the Spot Firm" was issued in July, and in the same month pilot one-stop shops were launched in four municipalities.<sup>9</sup> The program expanded over time and by the end of 2009 there were 164 one-stop shops dispersed in municipalities throughout the country. By the end of 2010 the number increased to 199, covering most of mainland Portugal and the autonomous region of Madeira.<sup>10</sup> Figure 1 below gives a graphical representation of the opening dates and geographical spread of the one-stop shops between 2005 and 2009.<sup>11</sup> An entrepreneur can register a new company under the "on the spot Firm" program in any of the one-stop shops located across Portugal. However, as documented by Branstetter et al. (2010), the fraction of firms registered outside their local municipality is trivially small.

[Figure 1 about here]

In 2007, the average time to set up a company through the "On the Spot Firm" was 47 minutes, with one procedure at one office desk. By 2008, over 70% of new firms were established through the "On the Spot Firm".<sup>12</sup> As a result of this program, Portugal is now one of the easiest countries to start a business, and the cost is around 3% of GDP per capita. Portugal was cited by the World Bank as "Top reformer" in business entry in 2006. The reform in 2005-2006 became part of a larger package for administrative and legislative simplification called "Simplex". This program is one of the most successful initiatives for red tape reduction in the industrialized world.<sup>13</sup>

## 4 Data and Descriptive Statistics

The main data source used in this paper is the *Quadros de Pessoal (QP)*, a longitudinal data set with linked information on workers and firms based in Portugal. These data have been collected annually by the Portuguese Ministry of Labour and Social Security, and answering the survey is legally mandatory for all firms employing at least one worker. The data include

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<sup>9</sup>Coimbra, Aveiro, Barreiro and Moita.

<sup>10</sup>Administratively, Portugal is divided into 308 municipalities. The municipality is the seat of local administrative and executive power.

<sup>11</sup>The program allows registration of all companies (single-shareholder companies, private limited companies, partnerships or public limited companies) except state-owned companies or firms in industries with industry-specific requirements, or which require special permits. These are mainly in the finance, insurance and transportation sectors; see Branstetter et al, 2010 for more details, and for a list of industries which cannot be registered on the one-stop shops. We exclude observations in these industries from our analysis.

<sup>12</sup>See [http://www.empresanahora.pt/ENH/sections/EN\\_homepage](http://www.empresanahora.pt/ENH/sections/EN_homepage)

<sup>13</sup>See Branstetter et al., 2010 for a more detailed description of the "on the spot firm" firm programme and for opening dates of all one-stop shops between 2005 and 2009.



all firms (over 250 thousand per year) and employees (more than two million per year) within the Portuguese private sector. In 2009, the most recent year for which the data is available, the dataset includes over three million workers and about 400 thousand firms. Each firm and each worker have a unique registration number which allows them to be traced over time.<sup>14</sup>

In general, the information refers to the situation observed in the month of October of each year, when the survey is collected, and it covers the firm, each of its plants and each of its workers. Information on workers includes, for example, gender, age, education level (schooling), level of skill, occupation, type of contract of employment, hiring date in the firm, promotions, monthly hours of work (normal and overtime) and earnings, which are split into each of its components (base wage, seniority payments, regular and irregular benefits, overtime pay).

Firm level data include, for example, the year of creation, industry, location, total number of workers, number of establishments, sales volume, legal structure and ownership structure (equity breakdown among domestic private, public or foreign). The administrative nature of the data and its public availability at the workplace, as determined by law, result in a high degree of coverage and reliability.<sup>15</sup>

The second data source used in this paper is the International Trade dataset collected by the Portuguese National Institute of Statistics (INE). This dataset includes the universe of monthly export and import transactions by firms that are located in Portugal. The data comes from customs return forms for extra-European Union trade. For intra-EU trade, the data is collected through the INTRASTAT declaration form supplied to INE. For this paper we use data on export transactions only, aggregated to the firm-year level.

We focus our analysis on the decade in which the "On the Spot Firm" program was introduced. Therefore, for the combined data set which merges the two data sources described above, we use data collected each year from 2002 to 2009.<sup>16</sup> We restrict our analysis to the private sector's manufactures and services, excluding agriculture, fishing and mining. Table A.1 in appendix reports the description (and the percentage distribution of observations) of the SIC 2-digit industries considered.

The resulting sample is composed of 431,692 distinct firms (contributing with 1,871,296 firm-year observations) and 3,899,878 workers (contributing 16,485,860 worker-year observations) over the period. We identify the creation of new firms using the reported year the firm was

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<sup>14</sup>Each firm entering the dataset is assigned a unique, time-invariant identifying number. The Ministry of Labor and Social Security performs several checks to ensure that firms that have already reported are not assigned a different identification number. Similarly, each worker is assigned a unique identifying number based on the social security number. We use these identifiers to follow workers and firms over time.

<sup>15</sup>The requirement of public availability facilitates monitoring by the Ministry of Employment of the firms' compliance with the law (e.g., with regard to illegal work). The data from Quadros de Pessoal has been used by Cabral and Mata (2003) to study the evolution of the firm size distribution; by Blanchard and Portugal (2001) to compare the U.S. and Portuguese labor markets; by Cardoso and Portugal (2005) to study the difference between contractual and actual wages, among others.

<sup>16</sup>QP data were not collected in 2001, and hence our analysis starts in 2002 rather than 2000. 2009 is the most recent year for which the data has been built.

constituted. A firm is considered to be a start-up if the year of creation is equal to the year of analysis. However, because the survey is collected in October, we recover some information on firm births if the year of creation is equal to  $t - 1$ , but the firm is observed for the first time in  $t$ . In these cases, we set the year of creation of the firm to  $t$ . The distribution of firms (existing firms and firm startups) and workers per year are shown in Table 1. Over the sample period there was a path of net firm and job creation, as the stock of firms and workers increased year after year. In 2009 we start seeing the effects of the global economic crisis and observe net firm and job destruction. Regarding the "on the spot firm" program, in 2005 23% of the new firms were created in municipalities with one-stop-shops, while after 2008 more than 70% were. Overall, in our data, 42,567 firms were created within counties with one-stop-shops.

[Table 1 about here]

The monthly wage of the worker is constructed by summing: (i) the base pay – gross amount of money paid (in the reference month) to workers on a regular monthly basis for the normal hours of work; (ii) tenure related payments; and (iii) regular payments. Real hourly wages, used in our specifications, are computed as real monthly wages (excluding overtime pay) divided by normal monthly hours of work (excluding overtime hours). The *Quadros de Pessoal* matched employer-employee data records information on both the education levels and the skill levels attained by each worker. We exploit this information and investigate the effects of the reform on the returns to education, and also on the returns to skill.

The level of education (schooling) of individuals in the *Quadros de Pessoal* is recorded according to the International Standard Classification of Education (ISCED), approved by UNESCO in November 1997. The correspondence between ISCED levels and years of schooling in Portugal is as follows: ISCED 1 – up to primary education, includes the first and second stages of basic education in Portugal (up to 6 years of schooling); ISCED 2 – lower secondary education, includes the third stage of basic education (9 years of schooling); ISCED 3 – upper secondary education (12 years of schooling); ISCED 5/6 – higher education, includes first and second stages of tertiary education (more than 15 years of schooling corresponding to university degrees).<sup>17</sup>

Firms are also requested to classify workers into 8 levels of qualification according to the complexity and responsibility of the tasks performed and the skill requirements of the task. The 8 levels of qualification are: 1 – Top executives (top management); 2 – Intermediary executives (middle management); 3 – Supervisors, team leaders and foremen; 4 – Higher-skilled professionals; 5 – skilled professionals; 6 – semi-skilled professionals; 7 – non-skilled professionals; 8 – Apprentices, interns and trainees. Table A.2 in the appendix shows a detailed description

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<sup>17</sup>In Portugal, there is no degree corresponding to ISCED level 4; and it is not possible to distinguish between ISCED levels 5 and 6 from the data.

of the hierarchical levels and their skill content in accordance with the law.<sup>18</sup> Each of these hierarchical levels can be considered as a layer in an hierarchy defined in terms of increasing responsibility and task complexity. For our analysis, the skill levels were collapsed into three categories: high- (levels 1 to 4), medium- (level 5) and low-skilled workers (levels 6 to 8). We also include the occupation as separate control in the regression analysis.

Our regressions include additional characteristics of the workers as covariates: gender, age and tenure (and their squares), the type of contract of employment held (whether open-end or closed-end contract), and occupation (7 categories).<sup>19</sup> We also control for firm characteristics: log of the size (size is measured by the number of workers employed by the firm), ownership status (private, public or foreign owned, depending on whether more than 50% of the firms' social capital is owned by private, public or foreign investors), whether the firm is an exporter and whether the firm is multi-plant. Industry, municipality (19 regions), and year dummies are also included to control for unobserved municipality and industry-specific characteristics, and aggregate shocks.

Descriptive statistics of the variables by education and skill levels are presented in Table 2.<sup>20</sup> In our sample, 12% of the workers have a university degree, and 23% are high-skilled workers. Medium-skilled workers represent the largest share (41%) of the labour force. Amongst the high-skilled workers, 42% have a university degree or higher, this confirms that our measure of skill is not a simple output of academic achievement of the workers. Conversely, 78% of highly educated workers performs more complex (high-skilled) tasks. Regarding the "on-the-spot" program, 41% of our observations are located in municipalities with one-stop shops.<sup>21</sup>

[Table 2 about here]

## 5 Industry Concentration and Returns to Education and Skill

This paper uses the "on the spot firm" entry deregulation reform in Portugal to investigate whether firm entry deregulation increases the returns to education and skills through increased product market competition. In this section, we start by documenting the correlation between

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<sup>18</sup>See the Decreto Lei 121/78 of July.

<sup>19</sup>Occupations are recorded with six digits in accordance to the National Classification of Occupations 1994. This is compatible with the International Standard Classification of Occupations (ISCO) 1988. We aggregate the classification of occupations into ISCO-88's major groups. The major groups are: 1 – Directors; 2 – Intellectual and scientific specialists; 3 – Professional and technical (intermediate); 4 – Administrative and managerial; 5 – Clerical and sales workers; 6 – Agriculture, silviculture and fishing; 7 – Production and related workers; 8 – Equipment operators and labourers, 9 – unqualified workers.

For our analyses we considered occupations 1 and 2 to be one group; and occupations 6 and 7 as another single group.

<sup>20</sup>For the sake of clarity and space, descriptive statistics on region, industry and year are not shown, but can be provided upon request to the authors.

<sup>21</sup>Since we want to interpret the effect of the "on-the-spot" program on wages, we do not consider municipalities of the last year of introduction of on-the-spot shops. This means that we removed all records (for all years) associated to the municipalities for which the on-the-spot shops were introduced in 2009.

competition and wages. We consider four commonly used measures of competition, defined at the industry (SIC 2-digit), municipality and year level: industry concentration ratios defined as the fraction of industry employment by the five largest firms (CR5employment) or by the fraction of industry sales accounted by the five largest firms (CR5sales) within the municipality; and the Herfindahl–Hirschman index of industry employment or of industry sales. These measures are interpreted as inverse measures of competition. In the next section, we proceed to our quasi-natural experiment and report reduced-form evidence on the effect of the "on the spot firm" program on the returns to education and skill.

In what follows, we exploit the panel variation to assess the relationship between competition and the returns to education and skill. We regress the logarithm of real hourly wages of individual  $i$ , in firm  $j$ , in industry  $s$ , municipality  $m$ , with educational level (skill level)  $k$  in year  $t$  on the measure of competition (CR5 or HHI), denoted by  $CI_{smt}$ , in the industry-year within municipalities, and its interaction with education (skill),  $CI_{smt} * S_{ikt}$  (ISCED1 and low-skill are the omitted categories), among other controls. We therefore run the following specification:

$$\ln w_{ijsmkt} = \alpha + \delta CI_{smt} + \rho S_{k,it} + \gamma(CI_{smt} * S_{k,it}) + \beta X'_{it} + \lambda Z'_{jt} + d_{(\cdot)} + \epsilon_{ijsmkt} \quad (1)$$

Where  $CI_{smt}$  is one of the four concentration indicators of industry  $s$ , in municipality  $m$ , at time  $t$ , and  $S_{k,it}$  is our measure of educational attainment (skill) of the worker, as described in Section 4.  $X'_{it}$  is a vector of individual characteristics,  $Z'_{jt}$  is a vector of firm characteristics (as described in Section 4, Table 2). We control for unobserved permanent individual characteristics ( $d_i$ ), and include industry ( $d_s$ ) and time ( $d_t$ ) dummies to account for unobserved industry characteristics and business shocks that affect all firms and workers in a municipality. Our coefficient of main interest is  $\gamma$ . It captures the correlation between returns to education (skill) and the industry's level of competition. If competition is positively correlated with the returns to education (skill) then we expect the sign of  $\gamma$  to be negative since concentration ratios and HHI indices are inverse measures of industry competition.

Results from estimating model (1) using employment-based concentration ratios and HHI as measures of competition are reported in Table 3. We obtain similar results, available upon request, when using sales-based measures. The upper part of Table 3 reports results for the effect of competition on the returns to skill, while the lower panel of the table reports results for the returns to education. Column (i) relates to a basic OLS specification which includes gender, age and tenure (and their squares) of the worker as covariates, along with industry and year dummies. In column (ii) we specify a within groups regression (i.e., we include individual fixed effects,  $d_i$ ) with the same set of covariates (except for gender); in column (iii) we specify the same within groups regression model, but including dummies for education (skill) interacted with year thus allowing for changes in returns to education (skill) over time in a flexible way. Column (iv)

further saturates the model with dummies for municipality, and includes the occupation and type of contract of the worker, the log of size and the ownership of the firm, as well as whether the firm is multiplant or exporter.

The results for returns to skill, reported in the upper panel of Table 3 show that the coefficient of interest, on the interaction between the skill levels and the industry concentration ratio, is negative and statistically significant. This suggests a negative correlation between concentration and returns to skill. In other words, results suggest that when competition increases the gap between high- and low-skill wages widens. Results obtained when using HHI to measure competition are consistent with the ones using the CR5 measure. Results reported in the last four columns of table 3 show a negative and statistically significant coefficient on the interaction between skill levels and industry HHI. The coefficients are also of similar magnitude.

The results for the correlation between industry concentration (or competition) and returns to education, are reported in the lower panel of Table 3. Contrary to the results on returns to skill, which show a clear negative effect of increased concentration on the returns to skill, a differential effect of industry concentration by education levels is not found. The coefficient on the interaction between industry concentration and education levels is not statistically significant, regardless of the measure of concentration used, CR5 or HHI.

[Table 3 about here]

While the results shown in Table 3 suggest that an increase in industry competition is related to larger returns to skill, the results are really only suggestive of correlations, because the use of concentration ratios and HHI as proxies for industry competition faces a number of clear limitations. These include: (i) the potential endogeneity resulting from the fact that these measures of concentration are endogenous outcome variables from the implicit competition parameters or barriers to entry; (ii) they are potentially non-monotonic in the competition parameters, for example, as discussed in Sutton (1991), higher competition generated via a reduction in entry barriers can lead to an increase in concentration in some industries; (iii) potential correlations with an omitted variable such as technical change; (iv) the fact that, conceptually, concentration ratios may not be good measures of competition. For example, as documented in Boone (2000), if firms differ in efficiency levels, an increase in competition can drive inefficient firms to exit the industry and thus increase concentration in the industry, not decrease concentration.

Therefore, the results presented in this section should be regarded as descriptive rather than showing of a causal effect. To try to establish a causal link between increased competition and returns to education and skill, in the sections that follow we use the "on the spot firm" program, which increased firm entry across industries, as an arguably more exogenous source of increased competition.

## 6 "On the Spot Firm" Program, Firm Entry and Industry Concentration

Before presenting results from the quasi-natural experiment on the returns to education and skill, we start by investigating the effect that the "on the spot firm" program had on firm entry and competition. The purpose of this analysis is to assess the validity of the "on the spot firm" program as a source of increased competition. In this section we investigate whether the reform of business registry increased firm entry and competition within industries. We do this by estimating the effect of the "on the spot firm" program on (i) the number of new firms created (positive correlation expected) per year within a municipality; and on (ii) the concentration measure (negative correlation is expected) of industry ( $s$ ) in municipality ( $m$ ) and year ( $t$ ). That is, we estimate the following model specifications

$$NewFirms_{smt} = f(Spot_{mt}, d_{(\cdot)}) \quad (2)$$

$$CI_{smt} = f(Spot_{mt}, d_{(\cdot)}) \quad (3)$$

In all specifications the "on the spot firm" dummy variable ( $Spot_{mt}$ ) takes the value of 1 for the year when and after an "on the spot firm" shop was introduced in municipality  $m$  in year  $t$ , and 0 otherwise (see Figure 1 for an overview of opening dates of the "one-stop shops" in Portuguese municipalities across the country). The dependent variable of model (3),  $CI_{smt}$ , is one of the measures of industry concentration, defined in the previous section. For each analysis we regress three model specifications which include as regressors: (i) only the "on the spot firm" covariate ( $Spot_{mt}$ ); (ii) "on the spot firm" dummy, and industry indicators to parse out any industry characteristics that may affect the outcomes ( $Spot_{mt}$  and  $d_s$ ); and (iii) we further saturate the model with year indicators ( $Spot_{mt}$ ,  $d_s$  and  $d_t$ ) to control for industry characteristics and year-specific factors.

The results of the analysis of the effect of the "on the spot firm" program on the number of new firms created in municipality  $m$  and year  $t$  (model 2) are displayed in Table 4. The top panel of the Table relates to a linear model of the number of firms created, while the bottom part relates to a negative binomial model for the same count data.

[Table 4 about here]

Our results suggest that the business registration reform increased the number of new firms created. The coefficient on the reform dummy is always positive and statistically significant at the 1% level. Looking at our negative binomial specification (bottom panel), the difference in the logs of expected counts of new firms is expected to be between 0.90 and 1.34 units higher

if "on the spot" shops exist. In other words, on average, municipalities with "on the spot" shops have around 4.3 more new firms being created within each industry per year (see ME on Table 4, column iii). Therefore, the effect of the "on the spot firm" program is economically meaningful with respect to the predicted number of firms created.

Our results on firm entry are in line with those obtained by Branstetter et al. (2010) and Bruhn (2011). Both these studies investigate the effect of simplified business entry registration reforms on the number of new firms created and on job creation. Branstetter et al. (2010) use data for Portugal and the same deregulation episode that is being exploited in this paper. The authors find that the reform increased the number of new firms per 100,000 inhabitants by around 17%. Using a similar reform in Mexico implemented from 2002, Bruhn (2011) finds a 5% increase in the number of registered new businesses and a 2.2% increase in employment. The effect of this type of reform on the returns to education and skills has received little attention in previous literature. This is the focus our study.

In table 5 we report results from estimating model 3, the effect of the "on the spot firm" reform on industry concentration, measured by the concentration ratio of the top 5 firms (CR5) in terms of employment (top panel) and sales volume (bottom panel) within the industry. For each measure of concentration, we report results from a linear regression model of the share of employment by the top 5 employers within an industry ( $s$ ) in municipality  $m$  and year  $t$  in the top panel; while the bottom panel relates to a fractional dependent variable model of the same dependent variable.<sup>22</sup> Our results suggest a negative effect of the reform on industry concentration, the coefficient on the reform dummy is always negative and statistically significant. These results suggests that the business registration reform had a positive effect on industry competition.

[Table 5 about here]

Our results on the effect of the "on the spot" firm on industry concentration also hold when we measure it by the Herfindahl–Hirschman indices (HHI). Estimates of model 3 using the HHI of employment within industry ( $s$ ) in municipality  $m$  and year  $t$  are displayed in the top panel of Table 6, while the bottom panel relates to HHI of sales volume within industry ( $s$ ) in municipality  $m$  and year  $t$ . The upper part of each panel reports results from a linear regression model, while the bottom part relates to a fractional dependent variable model of the same dependent variable. The effect of the reform on the HHI is negative (positive effect on competition), the coefficient on the reform dummy is negative and statistically significant.

[Table 6 about here]

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<sup>22</sup>In the fractional dependent variable specification we use a fractional probit as proposed by Papke and Wooldridge (1996).

In sum, results reported in tables 5 and 6 suggest that the business registration reform played a significant role in increasing competition within industries. Given the potential problems associated with using concentration ratios and HHI as measures of competition, in the next section we use the "on the spot firm" program as an exogenous source of increased competition to present quasi-natural experimental evidence of the effects on the returns to education and skills.

## 7 The Regulatory Quasi-Natural Experiment

The main results in this paper come from an exogenous event that reformed business registration in Portugal. As shown in the previous section, this reform has led to increased firm entry, and is associated with increased product market competition, measured by concentration ratios and HHI. In this section we investigate the effect of the reform on the returns to education and skills.

### 7.1 Empirical strategy

We use cross-municipality-specific and cross-time variation in the implementation of the business registration reform in Portugal to identify the effect of the deregulation on the returns to skill and education. As discussed in Section 3, in order to alleviate the bureaucratic burden of setting up an enterprise, the government that took office in March 2005 approved the law that created "on the spot firm" in July of the same year. This policy change was an unanticipated event, and arguably constitutes an exogenous policy change in business registration that induced changes in firm entry and industry competition.<sup>23</sup>

The one-stop shops are offices where entrepreneurs can register a new business in less than an hour. These shops were initially established in only a few municipalities, but progressively expanded to the rest of the country, as shown in Figure 1. Given that the timing of adoption of the reform varied across municipalities, we can exploit this time variation in our identification strategy. We therefore provide differences-in-differences estimates of changes in returns to educational attainment and skill levels. Eligible firms (firms within eligible industries) and individuals in municipalities with one-stop shops for business registration are the 'treatment group'.

Branstetter et al. (2010) have shown that early adopting municipalities, those that established one-stop shops between July 2005 and June 2007) are not statistically different from late adopting municipalities in a number of respects, such as: initial growth trends of total sales,

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<sup>23</sup> Although there were also local elections in October 2005 for the municipality chief executive, the introduction of "on the spot firm" shops seems unrelated with political affiliation. As discussed in Branstetter et al. (2010), 40% of the municipalities with one-stop shops had a Social Democrat municipality head, the main opposition party.



sales of new firms, number of firms, number of new firms. This supports our hypothesis, important for identification strategy, that administrative decisions to open one-stop shops are not correlated with existing trends in firm creation or economic growth.

To investigate the effects of the business registration reform on the returns to education and skill we estimate the following model:

$$\ln w_{ijmkt} = \alpha + \delta Spot_{mt} + \rho S_{k,it} + \gamma(Spot_{mt} * S_{k,it}) + \beta X'_{it} + \lambda Z'_{jt} + d_{(\cdot)} + \epsilon_{ijmkt} \quad (4)$$

where the dependent variable is the log of real hourly wages of worker  $i$  (in firm  $j$ , municipality  $m$  with skill/education level  $k$ ) in year  $t$ .  $Spot_{mt}$  is our treatment dummy for municipalities ( $m$ ) with one-stop shops; it takes the value of 1 in the year when and after a one-stop shop was introduced in the municipality.<sup>24</sup>  $S_{k,it}$  is our measure of skills or educational attainment of the worker (the levels  $S_k$  were described in Section 4).  $X'_{it}$  is a vector of individual characteristics, which include age and tenure and their squares, occupation and type of contract; and  $Z'_{jt}$  is a vector of firm ( $j$ ) characteristics which include the log of firm size, ownership structure (whether domestic private, public or foreign), a dummy for whether the firm is an exporter, and a dummy for whether the firm is multi-plant. Industry ( $d_s$ ) and time ( $d_t$ ) dummies are also included in all specifications to account for unobserved industry characteristics and business shocks that affect all firms and workers.

We also control for municipality ( $d_m$ ) fixed effects to parse out any municipality-specific factors that may affect our outcomes. Although we exploit cross-municipality and cross-time variation in the implementation of the reform, having a panel of linked employer-employee data allows us to include individual and worker-firm (match) fixed effects in our specifications,  $d_i$  and  $d_{ij}$ , respectively. These effects help controlling for potential biases arising from individual heterogeneity on the patterns of job mobility and sorting of workers across firms/industries. As discussed in Guadalupe (2007), unobserved time invariant worker effects also serve as control for compositional changes over time in observable characteristics within an industry.  $\epsilon_{ijmkt}$  is an error term assumed to be white noise. In all of our specifications standard errors are clustered at the industry level to account for potential correlation between observations within the same industry.

## 7.2 Results

Tables 7 and 8 report results from estimating equation (4). Two sets of analyses were conducted: one to investigate the effect of the firm entry reform on the returns to education (Table 7); and a similar analysis to investigate the effects on the returns to skill (Table 8). Observed

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<sup>24</sup>Some municipalities have more than one one-stop shop. Our treatment dummy is set to 1 after the first shop was opened.

characteristics of workers ( $X'_{it}$ ) and firms ( $Z'_{jt}$ ), as explained in the previous sections, along with industry ( $d_s$ ) and year ( $d_t$ ) dummies are always included. The different columns in tables 7 and 8 relate to different combinations of the other fixed effects included. In addition to industry and year dummies, column (i) also controls for worker unobserved effects ( $d_i$ ), column (ii) further adds in municipality fixed effects ( $d_m$ ) and column (iii) controls for match (firm-worker) unobserved effects ( $d_{ij}$ ) and municipality dummies. The coefficient on the  $Spot_{mt}$  variable,  $\delta$ , captures the average effect of the reform on the wages of the least educated or least skilled workers (the omitted categories). The absolute effects on other workers are given by the sum of  $\delta$  and the relevant element of  $\gamma$ . Our main interest lies in  $\gamma$ , the vector of coefficients on the interaction terms between the experiment variable,  $Spot_{mt}$ , and the educational (skill) levels,  $S_{k,it}$ . Each of its elements ( $\gamma_k$ ) captures the effect of the reform on the returns to different educational and skill levels.

[Table 7 about here]

Table 7 reports the results on the returns to education. The interaction terms between the educational levels and the reform dummy, are always positive and statistically significant at the 1% level. In particular, the coefficient on the interaction between the ISCED 5/6 and the treatment variable is 0.045, suggesting that after the introduction of the "on the spot firm" program the returns to having a university degree increased by around 5%. Similarly, the reform increased the returns to upper secondary education by around 2% relative to the omitted category (primary education). Thus, our results suggest that the business registration reform is associated with increased wage premia to better educated workers. These results are robust to the inclusion of worker-firm match unobserved time invariant effects. This is important because while in the individual fixed-effects models (columns (i) and (ii)) the effect of the reform is identified from both the individuals who stay in the same firm and those who move firm after the policy change, in the match fixed-effects specifications (column iii), the effect is identified only from variation over the time period for individuals who stay in the same firm. This ensures that unobserved changes in composition of employment are not driving our results. In sum, education (university degrees in particular) became more valuable after the deregulation reform.

Table 8 reports results of similar specifications using skill levels, instead of educational attainment levels. The estimates suggest that the "on the spot firm" reform is associated with an increase in returns to skill. The coefficient on the interaction term between high-skill level and the experiment dummy is estimated at around 3% and is always statistically significant across the different model specifications. This suggests that the reform is associated with an increase in the wage premium for high-skilled workers of around 3%. The increase in the premium for medium-skilled workers, however, is smaller (below 1%) and of uncertain significance, while the least skilled appear to have lower wages in treatment municipalities by half to one percent.

[Table 8 about here]

### 7.2.1 Robustness

As mentioned in section 3, entrepreneurs are not obliged to register a new firm in the municipality of the company's location. Although according to the Institute of Registration and Notarization, and discussed in Branstetter et al. (2010), the share of firms registered outside their municipality is "trivially small", in this section we address that concern by aggregating municipalities to the district level. Portugal is divided in 20 districts which are the largest geographic subdivision of Portugal with administrative and judicial authority. Given their size and administrative authority, it is very unlikely that an entrepreneur would register a company outside of its district.

Therefore, we test the robustness of our results to defining the reform dummy at the district level. To this end, we defined a new treatment dummy,  $Spot_{rt}$ , which takes the value 1 in the years when and after the first one-stop shop was introduced in a district.<sup>25</sup> Therefore,  $Spot_{rt}$  is a regional indicator for the introduction of the reform (instead of a municipality indicator). We then substitute this for  $Spot_{mt}$  in equation (4), leaving everything else the same. Results from estimating this new equation with different combinations of fixed effects (as described in the previous section) are reported in Table 9. They are consistent with those obtained previously, suggesting that the introduction of the business registration reform within regions increased the returns to education and skill. When we consider the existence of regional "on the spot" firms, we obtain a wage premium of about 5-6% to university graduates, and of about 4-5% to highly-skilled workers.

[Table 9 about here]

In sum, we have found a positive association between the business registration reform and increased competition. We have also identified wage premia for better educated workers, and larger premia for higher levels of educational attainment; we have also identified wage premia for highly skilled workers. The effects are estimated from within worker variation in the period after the reform. Alternatively, we include worker-firm fixed effects and thus identify the effects from individuals that stay in the same firm after the reform. Results are therefore not driven by changes in employment composition, and are supportive of education becoming more valuable after the reform.

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<sup>25</sup>Municipalities are sub-units of districts. In our sample there are 263 municipalities and 20 districts.

## 8 Conclusion

This paper uses a matched employer-employee dataset of the universe of private sector firms and workers in Portugal and a comprehensive episode of firm entry deregulation, unique in the industrialized world, as a quasi-natural experiment to investigate the effects of the deregulation on firm entry and how the resulting increase in competition affects the returns to skill and education. Prior to 2005 starting a new business in Portugal involved 11 procedures and 78 days, with a cost of around 13.5% of GDP per capita. In 2005 new legislation created the "on the spot firm" (Empresa na hora) program with the purpose of reducing the time, cost and complexity of starting a business. This initiative established one-stop shops where an entrepreneur can register a company in less than an hour in one office with a cost of around 3% of GDP per capita.

We start by investigating the effect of the program on firm entry and industry competition. Our results suggest that the reform increased the creation of new firms, and decreased industry concentration ratios and Herfindahl–Hirschman indices. We then use the business registration reform as a quasi-natural experiment to investigate the effects on the returns to education and skill. We exploit cross-municipality-year variation in the implementation of the business registration reform for identification. Our results suggest that the reform increased the wage premium of university graduates by around 5%, and that of being a high-skilled worker by around 3%. Less educated and low skilled workers, on the other hand, appear to have lost slightly from the reform.

We estimate several specifications of the wage model, controlling for different types of time invariant unobserved effects, and for industry-specific effects; in particular, we are able to allow for worker-firm (match) fixed effects and thus identify the effects solely from individuals who stay in the same firm after the reform. This is strongly indicative that we have identified a price effect rather than one driven by individuals' changes in employment: that is, education and skills seem to have become more valuable after the reform. The "On The Spot Firm" reform implemented in Portugal in 2005 provides an exceptional context to evaluate the effect of comprehensive firm entry deregulation. Given the general evidence that competition-enhancing policies increase innovation and growth (Aghion et al., 2009), evaluating the effects of a precisely defined policy such as this is important for future policy advice to other countries.

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## 10 Tables

Table 1: Sample size

Year	All firms	Start ups	% Start ups "On the spot"	Workers
	(i)	(ii)	(iii)	(iv)
2002	210,367	11,067		1,834,497
2003	217,618	13,316		1,881,599
2004	223,084	12,787		1,938,520
2005	239,992	14,677	22.94	2,103,552
2006	241,397	15,039	47.73	2,134,839
2007	246,282	16,299	57.47	2,191,564
2008	249,695	16,833	73.69	2,241,624
2009	242,861	14,049	72.97	2,159,665
Total	1,871,296	114,067	42,567	16,485,860

Source: Own calculations based on Portugal, MTSS (2002-2009).



Table 2: Summary statistics: means of covariates for whole sample, by educational levels and skill groups

Covariate	All	Education levels				Skill levels		
	Workers	ISCED1	ISCED2	ISCED3	ISCED56	Low	Medium	High
Ln(real hourly wage)	1.54	1.32	1.45	1.67	2.28	1.25	1.45	2.15
Education (baseline: ISCED1)								
ISCED2	0.21					0.24	0.23	0.14
ISCED3	0.21					0.17	0.22	0.27
ISCED56	0.12					0.02	0.05	0.42
Skill level (baseline: low skill)								
Medium	0.41	0.45	0.43	0.42	0.15			
High	0.23	0.09	0.15	0.28	0.78			
Women	0.44	0.40	0.42	0.51	0.53	0.54	0.38	0.40
Age	38.03	41.98	34.89	34.29	35.52	36.68	38.20	39.92
Tenure	7.67	9.07	6.70	6.60	6.05	5.96	8.05	9.76
Closed-end contract	0.27	0.23	0.32	0.29	0.26	0.36	0.24	0.17
Occupation (baseline: non-qualified workers)								
Equipment operators	0.11	0.16	0.11	0.05	0.00	0.12	0.14	0.03
Production and related	0.22	0.37	0.20	0.07	0.01	0.18	0.34	0.08
Clerical & sales	0.17	0.16	0.25	0.20	0.04	0.20	0.21	0.07
Admin & managerial	0.16	0.06	0.18	0.34	0.16	0.12	0.21	0.13
Professional & Technical	0.11	0.03	0.10	0.21	0.25	0.03	0.07	0.31
Directors & Sc Specialists	0.09	0.02	0.03	0.07	0.53	0.02	0.01	0.37
ln(size of firm)	4.21	3.86	4.23	4.59	4.80	4.29	3.90	4.62
CR5	0.13	0.09	0.13	0.17	0.19	0.11	0.11	0.18
Ownership status (baseline: private national)								
Public	0.04	0.02	0.04	0.06	0.07	0.03	0.03	0.08
Foreign	0.10	0.07	0.11	0.15	0.15	0.11	0.08	0.14
Exporter	0.44	0.38	0.44	0.50	0.53	0.40	0.42	0.53
Multi-plant	0.37	0.28	0.40	0.49	0.49	0.37	0.33	0.46
"On-the-spot" municipality	0.41	0.33	0.44	0.48	0.52	0.40	0.38	0.47
No. of observations	16,485,860	7,424,601	3,530,852	3,530,340	2,000,067	6,071,208	6,681,779	3,732,873

Note. Means were computed using only observations with non-missing values for all covariates (estimation sample). Source: Own calculations based on Portugal, MTSS (2002-2009).

Table 3: Effects of industry concentration, on the returns to skill and education

Industry concentration and returns to skill								
	CR5-employment and returns to skill				HHI-employment vs returns to skill			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
Medium	0.128*** (0.025)	0.059*** (0.008)	0.051*** (0.009)	0.050*** (0.007)	0.148*** (0.016)	0.048*** (0.006)	0.040*** (0.009)	0.038*** (0.008)
High	0.711*** (0.058)	0.149*** (0.009)	0.091*** (0.012)	0.078*** (0.010)	0.708*** (0.035)	0.137*** (0.008)	0.077*** (0.012)	0.065*** (0.010)
CR5(HHI)	-0.045 (0.049)	0.055*** (0.013)	0.057*** (0.013)	0.026* (0.014)	-0.003 (0.044)	0.054*** (0.017)	0.056*** (0.017)	0.021* (0.012)
Med*CR5(HHI)	0.069** (0.033)	-0.033*** (0.010)	-0.033*** (0.010)	-0.036*** (0.009)	0.082** (0.033)	-0.029*** (0.011)	-0.028** (0.011)	-0.033*** (0.009)
High*CR5(HHI)	-0.009 (0.080)	-0.039*** (0.012)	-0.043*** (0.012)	-0.040*** (0.013)	-0.005 (0.073)	-0.046*** (0.012)	-0.040*** (0.013)	-0.038*** (0.012)
R <sup>2</sup>	0.54	0.10	0.10	0.12	0.54	0.10	0.10	0.12

Industry concentration and returns to education								
	CR5-employment versus returns to education				HHI-employment versus returns to education			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
ISCED2	0.164*** (0.021)	-0.003 (0.004)	-0.010** (0.005)	-0.008 (0.005)	0.184*** (0.015)	0.002 (0.003)	-0.006 (0.005)	-0.007 (0.005)
ISCED3	0.358*** (0.039)	0.020*** (0.007)	-0.012 (0.014)	-0.013 (0.013)	0.363*** (0.026)	0.024*** (0.005)	-0.010 (0.014)	-0.013 (0.013)
ISCED56	0.956*** (0.047)	0.168*** (0.010)	0.080*** (0.018)	0.049*** (0.016)	0.934*** (0.035)	0.177*** (0.010)	0.084*** (0.021)	0.050*** (0.018)
CR5(HHI)	-0.012 (0.038)	0.026*** (0.009)	0.029*** (0.010)	0.002 (0.010)	0.035 (0.036)	0.024* (0.012)	0.026** (0.012)	-0.004 (0.010)
ISCED2*CR5(HHI)	0.056* (0.032)	0.016** (0.008)	0.014* (0.007)	0.007 (0.005)	0.042 (0.035)	0.020 (0.012)	0.021* (0.012)	0.011 (0.007)
ISCED3*CR5(HHI)	-0.002 (0.053)	0.015* (0.009)	0.011 (0.007)	0.003 (0.004)	-0.037 (0.050)	0.022 (0.016)	0.025* (0.015)	0.017 (0.011)
ISCED56*CR5(HHI)	-0.066 (0.096)	0.020 (0.013)	0.012 (0.015)	0.004 (0.015)	-0.071 (0.090)	-0.002 (0.016)	0.008 (0.015)	0.003 (0.014)
R <sup>2</sup>	0.54	0.09	0.09	0.12	0.54	0.09	0.09	0.12

Note: Log-hourly real wages as dependent variable, all specifications include as observed covariates: tenure and age (and their squares), industry and year dummies as in Table 2, and year effects. Column (i) includes indicator for gender. Column (iv) includes as further regressors: the occupation and type of contract of the worker; the ownership status and the log of size of the firm, whether firm is multi-plant or exporter. ISCED 1 - up to primary education (up to 6 years of schooling); ISCED 2 - lower secondary education, (9 years of schooling); ISCED 3 - upper secondary education (12 years of schooling); ISCED 5/6 -higher education (over 15 years of schooling corresponding to university degrees). Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 4: Effect of the "On the spot firm" program on firm creation

Effect of "on the spot firm" on # of firm start-ups (linear)			
	(i)	(ii)	(iii)
On the spot firm	2.357*** (0.652)	2.870*** (0.773)	3.479*** (0.921)
Constant	1.620*** (0.416)	0.369*** (0.116)	0.491** (0.195)
Effect of "on the spot firm" on # of firm start-ups (negbin)			
On the spot firm	0.898*** (0.076)	1.040*** (0.071)	1.341*** (0.081)
ME	2.357***	2.886***	4.262***
Constant	0.482* (0.257)	-0.454*** (0.013)	-0.389*** (0.061)
Industry	–	Yes	Yes
Year	–	–	Yes

Note: The dependent variable is the number of new firms created. One observation per municipality, industry and year corresponding to 54,839 records. ME stands for the marginal effect of the on the spot firm. Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 5: Effect of the "On the spot firm" program on industry concentration ratios - CR5

EMPLOYMENT			
Effect of "on the spot firm" on CR5 (linear)			
	(i)	(ii)	(iii)
on the spot firm	-0.087*** (0.017)	-0.132*** (0.014)	-0.167*** (0.015)
Constant	0.800*** (0.032)	0.794*** (0.002)	0.775*** (0.002)
Effect of "on the spot firm" on CR5 (fractional dep.var)			
on the spot firm	-0.279*** (0.055)	-0.553*** (0.033)	-0.708*** (0.039)
ME	-0.868***	-0.143***	-0.185***
Constant	0.843*** (0.113)	0.848*** (0.006)	0.765*** (0.011)
SALES			
Effect of "on the spot firm" on CR5 (linear)			
on the spot firm	-0.137*** (0.024)	-0.205*** (0.017)	-0.252*** (0.019)
Constant	0.674*** (0.043)	0.572*** (0.003)	0.552*** (0.004)
Effect of "on the spot firm" on CR5 (fractional dep.var)			
on the spot firm	-0.357*** (0.064)	-0.722*** (0.040)	-0.902*** (0.040)
ME	-0.137***	-0.212***	-0.262***
Constant	0.450*** (0.118)	0.211*** (0.006)	0.137*** (0.016)
Industry	-	Yes	Yes
Year	-	-	Yes

Note: The dependent variable is the CR5 concentration ratio for employment (top panel) and sales (bottom panel). One observation per municipality, industry and year corresponding to 54,839 records on employment regressions, sales regressions have 53,121 records. ME stands for the marginal effect of the "on the spot firm". Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 6: Effect of the "On the spot firm" program on Herfindahl Index (HHI)

EMPLOYMENT			
Effect of "on the spot firm" on HHI (linear)			
	(i)	(ii)	(iii)
on the spot firm	-0.083*** (0.020)	-0.153*** (0.012)	-0.189*** (0.014)
Constant	0.410*** (0.035)	0.274*** (0.002)	0.253*** (0.004)
Effect of "on the spot firm" on HHI (fractional dep.var)			
on the spot firm	-0.222*** (0.053)	-0.496*** (0.028)	-0.609*** (0.028)
ME	-0.083***	-0.150***	-0.180***
Constant	-0.227** (0.089)	-0.607*** (0.003)	-0.672*** (0.013)
SALES			
Effect of "on the spot firm" on HHI (linear)			
on the spot firm	-0.089*** (0.018)	-0.151*** (0.011)	-0.182*** (0.014)
Constant	0.329*** (0.031)	0.166*** (0.002)	0.150*** (0.005)
Effect of "on the spot firm" on HHI (fractional dep.var)			
on the spot firm	-0.265*** (0.053)	-0.533*** (0.031)	-0.636*** (0.030)
ME	-0.089***	-0.145***	-0.169***
Constant	-0.444*** (0.087)	-1.003*** (0.003)	-1.059*** (0.017)
Industry	-	Yes	Yes
Year	-	-	Yes

Note: The dependent variable is the Herfindahl-Hirschman Index (HHI) for employment (top panel) and sales (bottom panel). One observation per county, industry and year corresponding to 54,839 records. ME stands for the marginal effect of the "on the spot firm". Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 7: Quasi-natural Experiments: Effect of the "On the spot shop" on returns to education

	Returns to Education		
	(i)	(ii)	(iii)
Spot	-0.009*** (0.002)	-0.009*** (0.002)	-0.010*** (0.002)
ISCED 2*Spot	0.011*** (0.004)	0.011*** (0.004)	0.014*** (0.004)
ISCED 3*Spot	0.018*** (0.004)	0.018*** (0.004)	0.023*** (0.004)
ISCED 56*Spot	0.045*** (0.006)	0.046*** (0.006)	0.045*** (0.006)
ISCED 2	0.003* (0.002)	0.003* (0.002)	-0.005*** (0.002)
ISCED 3	0.019*** (0.002)	0.018*** (0.002)	0.003 (0.002)
ISCED 56	0.105*** (0.007)	0.104*** (0.007)	0.053*** (0.006)
Medium-skill	0.044*** (0.005)	0.044*** (0.005)	0.027*** (0.003)
High-skill	0.110*** (0.008)	0.110*** (0.008)	0.071*** (0.006)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	
municipality FE		Yes	Yes
Worker FE	Yes	Yes	
Match (worker-firm) FE			Yes

Note: Log-hourly real wages as dependent variable. Further worker covariates include: tenure and age (and their squares), occupation, type of contract of employment. Further firm covariates include: the log of size of the firm, the ownership, multi-plant, and exporting status. ISCED 1 - up to primary education (up to 6 years of schooling); ISCED 2 - lower secondary education, (9 years of schooling); ISCED 3 - upper secondary education (12 years of schooling); ISCED 5/6 -higher education (over 15 years of schooling corresponding to university degrees). All specifications have the same number of observations: 12,489,080. Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 8: Quasi-natural Experiments: Effect of the "on the spot firm" on the returns to skill

	Returns to Skill		
	(i)	(ii)	(iii)
Spot	-0.008*** (0.003)	-0.008*** (0.003)	-0.006* (0.003)
Medium-skill*Spot	0.007** (0.003)	0.007** (0.003)	0.002 (0.003)
High-skill*Spot	0.035*** (0.005)	0.036*** (0.005)	0.031*** (0.004)
Medium-skill	0.042*** (0.005)	0.042*** (0.005)	0.027*** (0.004)
High-skill	0.095*** (0.008)	0.095*** (0.008)	0.058*** (0.006)
ISCED 2	0.007*** (0.001)	0.007*** (0.001)	-0.001 (0.001)
ISCED 3	0.026*** (0.002)	0.026*** (0.002)	0.013*** (0.003)
ISCED 5/6	0.130*** (0.006)	0.129*** (0.006)	0.077*** (0.006)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	
municipality FE		Yes	Yes
Worker FE	Yes	Yes	-
Match (worker-firm) FE			Yes

Note: Log-hourly real wages as dependent variable. Further worker covariates include: tenure and age (and their squares), occupation, type of contract of employment. Further firm covariates include: the log of size of the firm, the ownership, multi-plant, and exporting status. ISCED 1 - up to primary education (up to 6 years of schooling); ISCED 2 - lower secondary education, (9 years of schooling); ISCED 3 - upper secondary education (12 years of schooling); ISCED 5/6 -higher education (over 15 years of schooling corresponding to university degrees). All specifications have the same number of observations: 12,489,080. Robust standard errors, clustered by industry, in parenthesis. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 9: Quasi-natural Experiments: Effect of the "on the spot firm" per REGION on the returns to education and skill

Returns to Education			
	(i)	(ii)	(iii)
Spot	-0.011*** (0.003)	-0.010*** (0.003)	-0.012*** (0.003)
ISCED 2*Spot	0.012*** (0.004)	0.012*** (0.004)	0.016*** (0.004)
ISCED 3*Spot	0.022*** (0.005)	0.022*** (0.005)	0.027*** (0.004)
ISCED 56*Spot	0.057*** (0.007)	0.057*** (0.007)	0.054*** (0.006)
ISCED 2	0.001 (0.003)	0.001 (0.003)	-0.009*** (0.003)
ISCED 3	0.012*** (0.003)	0.011*** (0.003)	-0.005 (0.003)
ISCED 56	0.082*** (0.009)	0.082*** (0.009)	0.033*** (0.006)
Returns to Skill			
	(i)	(ii)	(iii)
Spot	-0.012*** (0.003)	-0.011*** (0.003)	-0.009*** (0.003)
Medium-skill*Spot	0.008** (0.004)	0.008** (0.004)	0.003 (0.003)
High-skill*Spot	0.045*** (0.005)	0.045*** (0.005)	0.040*** (0.005)
Medium-skill	0.040*** (0.005)	0.040*** (0.005)	0.026*** (0.004)
High-skill	0.081*** (0.008)	0.081*** (0.008)	0.046*** (0.007)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	
municipality FE		Yes	Yes
Worker FE	Yes	Yes	-
Match (worker-firm) FE			Yes

Note: Log-hourly real wages as dependent variable. Further worker covariates include: tenure and age (and their squares), occupation, type of contract of employment. Further firm covariates include: the log of size of the firm, the ownership, multi-plant, and exporting status. ISCED 1 - up to primary education (up to 6 years of schooling); ISCED 2 - lower secondary education, (9 years of schooling); ISCED 3 - upper secondary education (12 years of schooling); ISCED 5/6 -higher education (over 15 years of schooling corresponding to university degrees). All specifications have the same number of observations: 12,489,080. Robust standard errors, clustered by industry, in parenthesis. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01



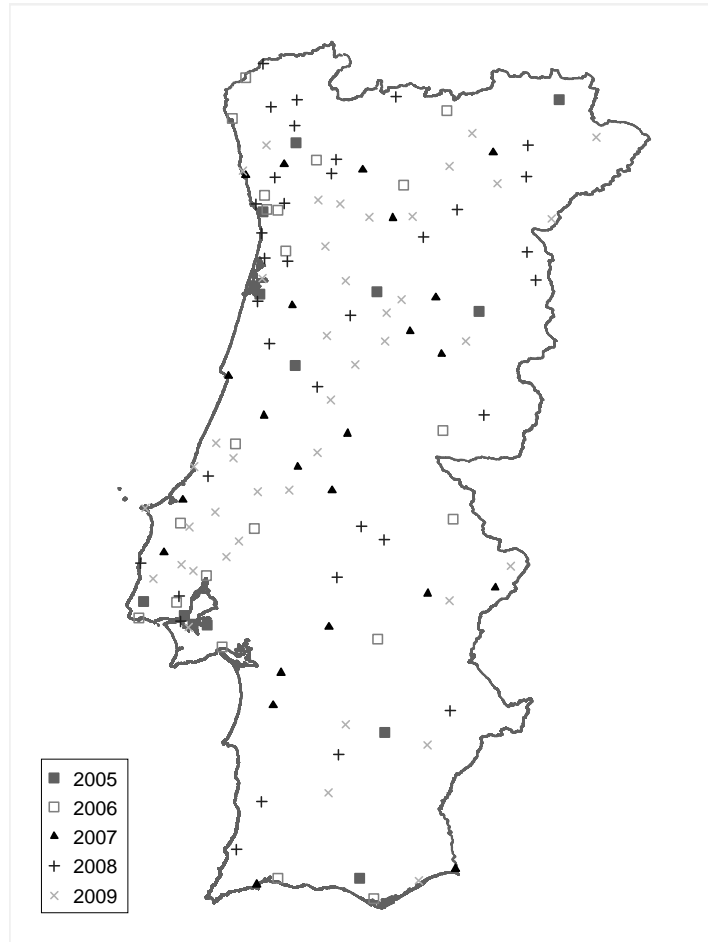


Figure 1: "On the Spot Firm": introduction of one-stop shops by year and municipality

## 11 Figures

## A Appendix

Table A.1: SIC2 - Industries

Industry	%	
15	Manuf. of food, beverages & tobacco	3.32
17	Manuf. of textiles	2.52
18	Manuf. of wearing apparel; dressing and dyeing of fur	3.17
19	Tanning and dressing of leather; Manuf. of luggage, handbags, saddlery, harness & footwear	1.75
20	Manuf. of wood & prods of wood & cork, except furniture; Manuf. of straw & plaiting materials	1.35
21	Manuf. of pulp, paper and paper products	0.45
22	Publishing, printing and reproduction of recorded media	1.21
24	Manuf. of chemicals & chemical prods; Manuf. of coke, refined petroleum prods & nuclear fuel	0.92
25	Manuf. of rubber and plastic products	0.86
26	Manuf. of other non-metallic mineral products	1.89
27	Manuf. of basic metals	0.36
28	Manuf. of fabricated metal products, except machinery and equipment	2.71
29	Manuf. of machinery and equipment n.e.c	1.28
31	Manuf. of electrical machinery and apparatus n.e.c.	0.68
32	Manuf. of radio, television and communication equipment and apparatus	0.48
33	Manuf. of medical, precision and optical instruments, watches and clocks	0.21
34	Manuf. of motor vehicles, trailers and semi-trailers	1.12
35	Manuf. of other transport equipment	0.27
36	Manuf. of furniture; others manufacturing activities, n.e.c.	1.67
37	Recycling	0.12
40	Electricity, gas & water	0.47
41	Water collection, treatment and distribution	0.14
45	Construction	11.88
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	3.51
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	7.14
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and HH goods	9.95
55	Hotels and restaurants	7.10
60	Land transport; transport via pipelines	2.80
61	Water transport	0.08
62	Air transport	0.42
63	Supporting & auxiliary transport activities; travel agencies and other tourist assistance	1.34
64	Post and telecommunications	1.50
65	Financial intermediation, except insurance and pension funding	2.77
66	Insurance, pension funding and other complementary activities of social security	0.53
67	Activities auxiliary to financial intermediation	0.24
70	Real estate activities	0.84
71	Renting of machinery and equipment without operator and of personal and HH goods	0.28
72	Computer and related activities	0.94
73	Research and development	0.10
74	Other business activities	9.77
80	Education	2.33
85	Health and social work	6.10
90	Sewage and refuse disposal, sanitation and similar activities	0.18
91	Activities of membership organizations n.e.c.	1.24
92	Recreational, cultural and sporting activities	1.10
93	Other service activities	0.92

Table A.2: Classification of Workers according to skill levels

Level	Tasks	Skills
1. Top executives (top management)	Definition of the firm general policy or consulting on the organization of the firm; strategic planning; creation or adaptation of technical, scientific and administrative methods or processes	Knowledge of management and coordination of firms' fundamental activities; knowledge of management and coordination of the fundamental activities in the field to which the individual is assigned and that requires the study and research of high responsibility and technical level problems
2. Intermediary executives (middle management)	Organization and adaptation of the guidelines established by the superiors and directly linked with the executive work	Technical and professional qualifications directed to executive, research, and management work
3. Supervisors, team leaders	Orientation of teams, as directed by the superiors, but requiring the knowledge of action processes	Complete professional qualification with a specialization
4. Higher-skilled professionals	Tasks requiring a high technical value and defined in general terms by the superiors	Complete professional qualification with a specialization adding to theoretical and applied knowledge
5. Skilled professionals	Complex or delicate tasks, usually not repetitive, and defined by the superiors	Complete professional qualification implying theoretical and applied knowledge
6. Semi-skilled professionals	Well defined tasks, mainly manual or mechanical (no intellectual work) with low complexity, usually routine and sometimes repetitive	Professional qualification in a limited field or practical and elementary professional knowledge
7. Non-skilled professionals	Simple tasks and totally determined	Practical knowledge and easily acquired in a short time
8. Apprentices, interns, trainees	Apprenticeship	

Note: Hierarchical levels defined according to Decreto Lei 121/78 of July 2nd (Lima and Pereira, 2003).